REMARKS

Claim 48 has been amended. Claims 29, 31-45, and 47-50 are currently pending in this application. The status of the application in light of the Office Action mailed July 21, 2006, is as follows:

(A) Figures 1-5 were objected to because numerous cross-sectioned elements were not cross-hatched.

(B) The abstract was required to be changed because the method claims in the application have been canceled and therefore references to methods in the abstract must be deleted.

(C) Claims 29, 31-39, 41-45, 47, 49, and 50 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 3,848,389 ("Gapp") in view of U.S. Patent No. 6,913,225 ("Arulf").

(D) Claims 40 and 48 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Gapp in view of Arulf as applied to claims 29 and 47, and further in view of U.S. Patent No. 4,556,591 ("Bannink").

As a preliminary matter the undersigned wishes to thank Patent Examiner Ferguson and Supervisory Patent Examiner Stodola for participating in an Examiner Interview on October 4, 2006. During the interview, the Gapp and Arulf references were discussed. Additionally, the MPEP requirements associated with combining references under Section 103 and with the Abstract of the Disclosure were discussed. Although no agreement was reached during the interview, the parties agreed if Gapp teaches away from a coupling device that has a first shank section and a second shank section, wherein a portion of the second shank section applies a first radial force to a second interior surface of a second structure and a first shank section applies at least approximately no radial force to a first

interior surface of a first structure, the 103 rejection based on Gapp and Arulf would have to be withdrawn.

A. Response to Figure Objections

Figures 1-5 were objected to because numerous cross-sectioned elements were not cross-hatched. Enclosed in the Appendix are amended Figures 1-5 in which applicants have added cross-hatching for several cross-sectioned elements. Accordingly, the objection to Figures 1-5 should be withdrawn.

B. Response to Requirement to Amend Abstract

The abstract was required to be changed because the method claims in the application have been canceled and therefore references to methods in the abstract must be deleted. As discussed during the above referenced Examiner interview, the undersigned believes that this requirement is improper and contrary to the Abstract requirements in 37 CFR § 1.72(b) and MPEP § 608.01(b). Accordingly to 37 CFR § 1.72(b) the purpose of the abstract is to enable the United States Patent and Trademark Office and the public generally to determine quickly from a cursory inspection the nature and gist of the technical disclosure. Accordingly, because both methods and apparatuses are disclosed in the specification of the pending application, it is appropriate to include a reference to both methods and apparatuses in the Abstract of the Disclosure. Nonetheless, in an attempt to expedite prosecution, the Abstract of the Disclosure has been amended to delete all references to methods.

C. Response to Section 103 Rejections Based on Gapp

Claim 29 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Gapp in view of Arluf. As described below, the rejection of claim 29 should be withdrawn because Gapp and Arluf do not disclose or suggest all of the features of this claim.

(1) Claim 29 is directed to a system that, *inter alia*, includes a composite material joined to a metallic material.

Claim 29 is directed toward a system of joined structures that includes a first structure having a first aperture in a composite material. The first aperture has a first interior surface and a first minimum radial extent. The composite material is configured so that a small radial force applied to the first internal surface will damage the composite material. The system further includes a second structure that has a second aperture in a metallic material. The second aperture has a second interior surface and a second minimum radial extent at least approximately the same as the first minimum radial extent. The system still further includes a coupling device that has a first shank section extending through the first aperture and a second shank section extending through the second aperture, but not extending into the first aperture. The first shank section of the coupling device has at least one of a hardness, toughness, and density greater than that of the second shank section of the coupling device, wherein (1) a portion of the second shank section has a greater radial extent than the first shank section, (2) the portion of the second shank section applies a first radial force to the second interior surface and the first shank section applies at least approximately no radial force to the first interior surface, and (3) the composite material proximate to the first aperture is undamaged.

(2) Gapp discloses a bimetal rivet with expansion characteristics that insures a hole in a first plate and a hole in a second plate are both filled when the bimetal rivet is upset.

Gapp discloses a bimetal rivet that has a head or shank configured of a high strength metal, and a tail or head forming end made of a ductile metallic material (col. 1, lines 28-32). Additionally, the geometry at the point where the two different materials are joined facilitates the formation of the rivet head (col. 1, lines 51-57). The bimetallic rivet in Gapp allows two plates to be joined together so that a hole in the first plate and a hole in the second plate are both filled, providing a satisfactory rivet bearing configuration (col. 2, lines 27-41; col. 3, line 43-col. 4, line 15).

As discussed during the above referenced Examiner Interview (with regard to providing a satisfactory rivet bearing configuration) the Gapp reference recites the following:

> The use of special alloys and metals for rivets has been increasing over recent years. . . A material which offers the satisfactory strength properties is usually difficult to rivet by conventional methods. They do not have sufficient ductility and are not readily formable into a rivet head. This often results in the formation of an unsatisfactory rivet or the actual splitting of the head during riveting. (col. 1, lines 5-23)
>
> It is therefore an object of our invention [the Gapp invention] to provide a rivet of a high strength alloy such as those of titanium on which it would be possible to form a satisfactory rivet head. (col. 1, lines 24-27) . . .
>
> Referring now more particularly to FIG. 1 and FIG. 2, there are seen plates 1 and 2 in the process of being joined together by rivets 3. A flat or countersunk head rivet is shown in FIG. 1, while a button head rivet is shown in FIG. 2. Our invention may be adapted to any style of rivet head, as will become evident from what follows. The body or shank of the rivet 4 is joined to the tail section 5 at interface 6. It is evident that in each Figure, one rivet is shown before driving and one after driving. The location of the interface 6 is shown before driving and 6a after driving. After driving, the driven head appears at 7, the lower portion of the rivet at 8, and the upper portion at 9. (col. 2, lines 5-20)
>
> In previous constructions attempts have been made to heat treat the tail section 5 of the rivet, which, of course, was composed of a single metal, in order to render it more ductile and formable. This, however, resulted in a gradual change in properties of the rivet shank and not a sudden change as in the present invention. Consequently, when the rivet was driven, the upsetting action of the shank was not uniform and the rivet did not completely fill the rivet hole at the upper section 9 as shown on FIG. 1. To develop its proper maximum strength, the rivet shank or body should completely fill the rivet hole as shown at 9 in FIG. 2, as is well known to those skilled in the art. (col. 2, lines 21-33)
>
> Attempts have been made to overcome this by using a washer between plate 2 and head 7 to facilitate formation of the head in a difficult to deform rivet shank. **Use of the rivets of the present invention, of course, eliminates the need for a washer, enables us to provide a satisfactory head 7, as well as a satisfactory rivet bearing in the rivet hole, as shown at 8 and 9 in FIG. 2.** (col. 2, lines 34-41) . . .

> With [the] configuration [shown in Figure 3] we have discovered that a good head 7 may be formed while also providing for improved expansion of the shank 4 into the holes in plates 1 and 2 as shown. (col. 3, lines 53-56) . . .
>
> In the configuration of FIG. 4 . . . [t]he shank section protrudes a considerable distance beyond the outer surface of plate 2 and hence the riveting action produces a greater upsetting effect upon shank section 4 insuring more complete filling of the holes in plates 1 and 2 by the rivet shank. (col. 4, line 57-col. 4, line2) . . .
>
> In . . . FIG. 5, . . . there is seen an expansion of the shank section 4 to completely fill the holes in plates 1 and 2 and also an upset of the shank section 4 outside the plate. (col. 4, lines 3-15) [Emphasis Added]

Except for Figure 1, which is identified as illustrating an unsatisfactory rivet bearing configuration, all of the Figures in Gapp (Figures 2-5) show and describe a rivet that has been expanded into the holes in plates 1 and 2 (see above cited portions of Gapp and Figures 1-6).

(3) Arulf discloses threaded fasteners used to join a first construction element to a second construction element.

In Arulf, a first (female) threaded fastening element 26 is fixed to carbon fiber layers 23, 24 of a first construction part 21 via glue (col. 4, line 30-col. 5, line 17; Figure 2). A second (male) threaded fastening element 31 passes through a second construction element and is screwed into the first threaded fastening element 26 to join the first and second construction elements 21, 22 (col. 5, lines 18-46; Figure 2). Figure 1 of Arulf, which is relied upon by the Examiner, shows specially designed bolts 8 used to join a rotationally symmetrical first construction part 1 made of carbon fiber layers 3, 4 and a core material 5 with a ring-shaped second construction part 2 made of aluminum (col. 3, lines 45-61; Figure 1). Arulf specifically acknowledges that bolts or threaded fasteners and/or glue are the techniques used to join carbon fiber elements with aluminum elements (col. 1, lines 18-64).

(4) Gapp and Arluf do not teach or suggest all the features of claim 29.

Gapp and Arulf fail to teach or suggest, *inter alia*, a coupling device that has a first shank section extending through a first aperture in a composite material and a second shank section extending through a second aperture in a metallic material, where the first shank section of the coupling device has at least one of a hardness, toughness, and density greater than that of the second shank section of the coupling device, and wherein (1) a portion of the second shank section has a greater radial extent than the first shank section, (2) the portion of the second shank section applies a first radial force to the second interior surface and the first shank section applies at least approximately no radial force to the first interior surface, and (3) the composite material proximate to the first aperture is undamaged. Gapp specifically teaches that the Gapp rivets join two plates together with a rivet that has a satisfactory head, as well as a satisfactory rivet bearing in the rivet hole, as shown in FIG. 2 of Gapp, where the holes in both of the plates are filled by the rivet. Gapp goes onto explain that previous attempts have been made to heat treat the tail section of a rivet in order to render it more ductile and formable to facilitate head formation during the upsetting process. However, Gapp states that these previous attempts have resulted in the unsatisfactorily driven rivet, as shown in Figure 1 where the rivet does not completely fill the holes in both plates. Accordingly, Gapp does not teach or suggest that the configuration shown in Figure 1 (where only a portion of one hole in one plate is filled by the rivet) is an acceptable, desirable, or usable way to upset a rivet; that this configuration has ever been an acceptable, desirable, or usable rivet configuration; or that the configuration is useful for joining a composite material to a metallic material.

Additionally, in the above referenced Office Action, it is admitted that Gapp fails to disclose a system using a rivet to join two structures "wherein the first structure is a composite material, the composite material configured so that a small radial force to the first internal surface will damage the composite material . . ." The Office Action relies on Arulf to correct this deficiency, stating that "Arulf et al. teach[es] that carbon fiber material

and aluminum material may be joined by bolts, threaded fasteners, glue or any other equivalent fastening means, such as rivets." The undersigned disagrees.

Arulf explicitly discloses using glue or threaded fasteners to join a carbon fiber material to an aluminum material; not a fastener such as a rivet or a fastener where (1) a portion of a second shank section has a greater radial extent than a first shank section, (2) the portion of the second shank section applies a first radial force to the second interior surface and the first shank section applies at least approximately no radial force to the first interior surface, and (3) the composite material proximate to the first aperture is undamaged. The undersigned was unable to find any reference in Arulf to suggest using "any other equivalent fastening means, such as rivets" to join a carbon fiber material to an aluminum material. Additionally, during the interview, the Examiners were unable to point to any portion of Arulf to support the contention that Arulf discloses using "any other equivalent fastening means, such as rivets" to join a carbon fiber material to an aluminum material. Furthermore, the undersigned respectfully submits that the Doctrine of Equivalence does not allow "any other equivalent fastening means, such as rivets" to be read into a reference for the purpose of a 103 rejection, as suggested by Examiner Stodola (*see e.g.,* MPEP §2186 for the relationship of the Doctrine of Equivalence to patentability). Accordingly, Gapp and Arulf do not support a *prima facie* case of obviousness under §103.

Furthermore, even if for the sake of argument Gapp and Arulf together did disclose all of the elements of claim 29, the combination of Gapp and Arulf is improper and cannot support an obviousness rejection of claim 29. The MPEP explains the fundamental criteria for an obviousness rejection under §103 as follows:

> To establish a *prima facie* case of obviousness three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success.

> Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. **The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure**.

MPEP § 2142 (emphasis added). Additionally, the MPEP specifically warns that the Examiner must explain why one of ordinary skill in the art would be motivated to alter Gapp in view of Arulf to arrive at the claimed invention:

> The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. Although a prior art device "may be capable of being modified to run the way the apparatus is claimed, there must be a suggestion or motivation in the reference to do so."

MPEP § 2143.01, quoting *in re Mills*, 916 F.2d 680 (Fed. Cir. 1990). (Emphasis in original.)

MPEP § 2145 goes on to state that "[i]t is improper to combine references where the references teach away from their combination." (MPEP § 2145 X. D. 2). The MPEP further states that "proceeding contrary to accepted wisdom in the art is evidence of nonobviousness" (MPEP § 2145 X. D. 3). Accordingly, because Gapp teaches away from pending claim 29, a *prima facie* case of obviousness has not been shown.

Even if the Gapp rivet could be used to join the structures in Arulf, doing so would destroy the principle of operation of Arulf and Gapp because one of the structures would be damaged. As discussed in the Background section of the present application, current methods of joining a composite material to a metallic material include bolting the materials together or drilling an oversize hole in the composite material and joining the two structures with a rivet. More particularly, when riveting a composite material to a metallic material, a larger hole is drilled in the composite material than is drilled in the metallic material so that

when a rivet is inserted and upset, the rivet does not contact the sides of the hole in the composite material, thereby damaging the composite material. In Gapp, a principle of operation is to rivet two plates together so that the hole in the first plate and the hole in the second plate are both filled to provide a satisfactory rivet bearing configuration. Accordingly, using the Gapp rivet to join a composite material and a metallic material would result in damage to the composite material and would destroy the principle of operation of both Arulf and Gapp because neither reference intends for a structure to be damaged. Therefore, for at least this reason, the reliance on these references to support a rejection under Section 103 is improper.

Additionally, one skilled in the art would not be motivated to combine a rivet configuration identified by Gapp as being unsatisfactory (shown in Figure 1 of Gapp) with Arulf to arrive at the configurations of claim 29 because Gapp specifically teaches away from using the unsatisfactory configuration. Gapp specifically identifies the configuration shown in Figure 1 (in which the rivet does not fill both holes) as being an unsatisfactory rivet bearing configuration (col. 2, lines 30-33; col. 1, lines 5-27). Modifying the Gapp rivet so that it does not expand into the hole in one of the plates would only be done by ignoring the teachings of Gapp and with the impermissible hindsight of the present application. Accordingly, modifying the Gapp rivet to join a composite material and a metallic material would destroy the teachings of Gapp. Therefore, for at least this additional reason, even if for the sake of argument the combination of Gapp and Arulf taught all of the elements of claim 29, the combination of these references would be improper.

Furthermore, one skilled in the art would not be motivated to combine the Gapp reference with the Arulf reference to arrive at the elements of claim 29 because doing so would be proceeding contrary to accepted wisdom in the art as described in both references. Gapp discloses bimetal rivets for joining two plates together so that a hole in the first plate and a hole in the second plate are both filled by the rivet, providing a satisfactory rivet bearing configuration. Arulf teaches a threaded fastener for joining two structures together and specifically notes that threaded fasteners and glue are the

techniques used to join a composite material with a metallic material. Accordingly, there is nothing in either reference to motivate one skilled in the art to use a rivet configuration in Gapp that is described as having unsatisfactory rivet bearing characteristics to join two plates together. Additionally, there is nothing in either reference to motivate one skilled in the art to replace threaded fasteners or glue with rivets to join a carbon fiber material to an aluminum material because Arulf states that threaded fasteners or glue are used for this purpose. Accordingly, even if for the sake of argument the combination of Gapp and Arulf taught all of the elements of claim 29, one skilled in the art would not be motivated to combine these references without using impermissible hindsight in light of the present application. Accordingly, for at least this reason, the reliance on these references to support a rejection under Section 103 is improper.

Additionally, even if the combination of Gapp and Arulf disclosed all of the elements of claim 29, the combination of these references would be improper because a principle of operation of Gapp would be destroyed. The MPEP specifically states that "If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious." MPEP § 2143.01 citing *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959). A principle of operation of Gapp is to provide a bimetal rivet for joining two plates together so that a hole in the first plate and a hole in the second plate are both filled, providing a satisfactory rivet bearing configuration. A principle of operation of Arulf is to reduce the number of threaded fasteners required to join a composite material to a metallic material by providing a threaded fastener that efficiently joins the two structures together. Accordingly, even if the Gapp rivet could be used to join the structures in Arulf, doing so would destroy the principle of operation of Gapp because it would require the use of a rivet configuration which Gapp identifies as being unsatisfactory. Therefore, for at least this reason, the reliance on these references to support a rejection under Section 103 is improper. Accordingly, the Examiner has failed to establish a *prima facie* case of obviousness and the rejection of claim 29 should be withdrawn.

Claims 31-41 depend from claim 29 and, for this reason and for the additional features of these claims, claims 31-41 are also patentable over Gapp and Arulf. Independent claims 42, 45, and 47 contain features generally similar to those of claim 29 and, for this reason and for the additional features of these claims, claims 42, 45, and 47 are also patentable over Gapp and Arulf. Claims 43-44, claim 49, and claims 48 and 50 depend from claims 42, 45, and 47, respectively. For this reason and for the additional features of these claims, claims 43-44, claim 49, and claims 48 and 50 are also patentable over Gapp and Arulf.

In view of the foregoing, the pending claims comply with 35 U.S.C. § 112 and are patentable over the applied art. The applicant accordingly requests reconsideration of the application and a Notice of Allowance. If the Examiner has any questions or believes a telephone conference would expedite prosecution of this application, the Examiner is encouraged to call the undersigned at (206) 359-6477.

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Respectfully submitted,

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AMENDMENTS TO THE DRAWINGS

Enclosed in the Appendix are amended Figures 1-5 in which applicants have addressed cross-hatching for any of the numerous cross-sectioned elements. In accordance with the Office's revised format, the pages containing these drawings have been labeled "Replacement Sheet."

APPENDIX